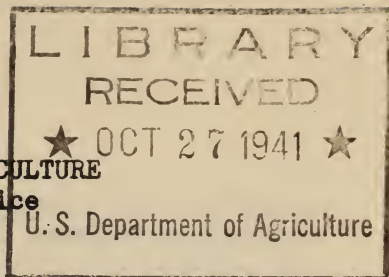


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UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service



INSTRUCTIONS REGARDING INSTALLATION AND USE OF ARTIFICIAL
DAYLIGHTING IN COTTON CLASSIFICATION LABORATORIES

ADOPTION
OF UNIT

The Macbeth skylight unit is designed to provide artificial daylight for cotton classification. Careful laboratory and practical tests, which included studies of other illuminants (fluorescent, carbon arc, carbon dioxide, and another filter type), demonstrate that it is the best of those studied. The Macbeth unit can therefore be adopted as a standard for use as artificial daylight in the cotton classification rooms of the Agricultural Marketing Service.

DESCRIPTION

The Macbeth unit consists of a metal box which contains: six incandescent lamps, Alzak reflectors, Corning Daylite filters, a ventilating system, and diffusing glass. The overall length (including ventilating motor on outside platform) is approximately 79", width 36", height 27"; the weight when hung is approximately 450 pounds. The filters (Corning #590 - 11" diameter) when used with large wattage incandescent bulbs provide the best commercial reproduction of daylight that it has been found possible to obtain. The chief disadvantage is the high power consumption required to obtain this reproduction. Units are usually supplied for 110 to 120 volt current, for use on a 3- or 4-wire circuit, but they can be wired to operate on other voltages and circuits.

HANG AT
ANGLE

Units should be hung at an angle of 21° from the horizontal, at an average height of 8 feet, and should be used like a small skylight. When so hung, this unit, which has a 2-inch flange, will be 8 feet, 4-1/2 inches from the floor on the high side and 7 feet, 3-1/2 inches from the floor on the low side. If an average height of 8 feet is not possible, the height may be less, but the low side should clear the heads of persons who are to work under it.

1000-WATT
vs
750-WATT

At the recommended height, 1000-watt lamps should be used; at a lower height, 750-watt lamps (frosted bulbs) may be used. There will be little or no change in color of the light by this substitution, but the intensity will be reduced. Intensity specifications for cotton classification call for 60 to 80 footcandles on the working level, which is more than "good light" for winter months, but less than "good light" for summer months. If 750-watt

lamps provide sufficient light their use is preferable and if, on the basis of future experience, it is found that 750-watt lamps are preferred they will be made standard. Lamps are rated to operate 1000 hours which means that under ordinary conditions lamps should be replaced about once a year, oftener if operated constantly. They might be replaced at the beginning of each cotton season.

VENTILATION

Forced ventilation is provided to carry off objectionable heat. The blower is equipped with a resilient base motor, guaranteed to operate at an angle of 21° , and with a minimum of noise and vibration. The intake and exhaust ducts must extend to the outside, their size to vary in accordance with their length. The cheapest and most direct connection can be made by using the upper pane of a nearby window. Ducts should be as straight and as short as possible, and elbows should have a radius of at least $1\frac{1}{2}$ the diameter of the pipe used in order to allow the air to flow freely. This will mean a 7-joint elbow for a 90° turn. If the ventilation is adequate the heat generated is negligible, therefore proper ventilation is of prime importance. When the ventilating duct is attached to the unit, vibration should be eliminated, perhaps by using a flexible joint. If much of the exhaust duct is exposed in the room, it may be insulated to reduce radiation. It is important that the blower motor be connected so that it will be impossible to complete the circuit to the lamps without also completing the circuit to the motor.

NOISE

Units should be free from noise except that caused by the moving air. The chains on which the units are hung may be cushioned. In no case should the chains rest on the top of the unit.

CONTINUOUS SKYLIGHT

A continuous skylight may be effected by placing several units end to end. A distance of from $8\frac{1}{2}$ to 9 feet, center-to-center, provides the best distribution of light when units are hung at prescribed height, although units may be placed as far apart as 10 feet, center-to-center; distances of less than $8\frac{1}{2}$ feet between centers are undesirable because they give more light between units than directly below each unit. When used as a continuous skylight, units may be purchased without individual blowers, and a single blower used for a 1-pipe connection for the several units. For example, in a 10-unit installation, a #4 blower and 26" pipe are suggested for intake and exhaust. An inside classing room with continuous artificial skylight will be most satisfactory when provided also with controlled temperature and humidity. If temperature control is not available it is best to place a continuous skylight on a story other than the top floor which in warm weather is usually the warmest floor of a building.

**POSITION AND
SURROUNDINGS**

In hanging these units wall spaces and cross illumination should be considered and treated as they would be in a skylight installation. The units should not be considered as supplementary illumination, but should be planned for use as a regular skylight. Walls should be a neutral gray, light enough not to absorb too much of the light, dark enough to avoid high contrast and glare. The gray selected depends on the amount of light in the room; if the whole room is well lighted, as in a classing room with a standard government skylight, the gray can be reasonably dark (as dark as a Munsell N 6/), but if there is not much light, then what there is can be conserved by using a very light gray on the walls. Care should be taken to be sure that the gray is neutral, that is, with no trace of any hue.

**AUXILIARY
LIGHTING**

When several units are used in a room that has little natural lighting, auxiliary lighting that will avoid shadows and sharp contrast should be provided. Fluorescent daylight units of appropriate size can be used for this purpose; they should be set higher than the 8-foot level of the Macbeth classing units, and should be faced away from the classing tables, so that none of the light from these auxiliary units falls on the classing table. There should be sufficient illumination of this sort to light satisfactorily the rest of the room.

**CLASSING
POSITION**

The best position for classing is for the classer to stand back barely under the low side of the unit, facing in the direction in which the illumination is turned. Thus when a cotton sample is held in the hands (generally at about 21°) the illumination from the unit will reach it normally. One of the advantages of standing at the rear of the unit is that the classer receives only a small amount of radiant heat on his body.

CLEANING

It is important that units be kept clean, for dust accumulates and reduces the intensity of illumination. Unit interiors ordinarily should be cleaned at least once a month, an operation that is very simple, since inside surfaces are easy to get at. Glass surfaces may be wiped off with a damp cloth. Soap should not be used, but a small amount of ammonia added to the warm water in which the cloth is dampened will help to clean glass surfaces. Do not clean while glass is hot, and do not turn on the electricity until all surfaces are completely dry.

**UNITS FOR GRADING
OTHER PRODUCTS**

Smaller units, ventilated by natural draft, are also available. Since these are generally for use about 20 inches above the table, they would be unsatisfactory for cotton classing. (A large unit requires

larger lamps, larger filters, and forced draft, but is necessary for cotton classing if the classer is to work under conditions similar to those of a well-lighted classing room.) Smaller units provide the same quality of illumination as the large ones; they are adaptable for the grading of products which can be held in a more or less fixed position.

**CHECK ON USE
OF UNIT**

Wherever these units have been installed, it has been for the benefit of the classing service. All classers are requested to cooperate by using these units not only on dark December days, but on bright

June days as well; if 750-watt lamps provide enough light when used during the fall months, do they also provide enough light in summer months? The answer to this question is not an obvious one, but should be determined by each classer for himself.

The use of the unit by the classer at all times of the year will enable him to judge differences in appearance due to varying conditions of natural lighting so that he may make allowance, if he finds it necessary, that will help to keep classification consistent throughout an entire season. Cottons may not seem to look quite so bright in the early season under the lamp unit yet toward the end of the season they will probably seem slightly too good; if in such cases the classer will keep in mind the fact that the lamp unit is the thing that has not changed, he can help himself and the entire classification service by making full use of experience that may be gained by the use of these units.

Some classers prefer to use the units in the regular classification room, others prefer to use them in a separate room, or to separate them from the main classing room by a curtain or folding doors. If specifications for uniform use are to be developed, which of these conditions should be made standard? The opinion of many classers is needed; opinions gained from sustained rather than occasional or casual use of the unit.

**SUGGESTIONS
ASKED**

Each permanent classer in the Cotton Division of this Service has had an opportunity to correct and add to these instructions. If at any time a classer thinks there should be changes that will correct or make them more useful, or that will

lead to improvements regarding the use of these artificial daylight units, he is asked to communicate his suggestions directly to Carl H. Robinson, Cotton Division, Agricultural Marketing Service, Washington, D. C.

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